

Form PTO-1449 (REV. 7-80)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		Atty. Docket No. 79132Y		Serial No. 08/471,890	
<b>LIST OF PRIOR ART CITED BY APPLICANT</b> (Use several sheets if necessary)				Applicant Donald R. Huffman, et al.			
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<b>PATENT DOCUMENTS</b>							
EXAMINER INITIAL*		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE (if appropriate)
SH	AA	2,635,994	4/27/50	Tierman			
	AB	2,957,756	10/60	Bacon			
	AC	3,009,783	12/4/59	Sheer, et al.			
	AD	3,172,774	2/28/61	Diefendorf			
	AE	3,317,354	5/2/67	Darrow, et al.			
	AF	4,132,671	2/2/79	Deininger, et al.			
	AG	4,167,444	9/11/79	Schweiger			
	AH	4,435,375	3/6/84	Tamura, et al.			
	AI	4,435,378	3/6/84	Reck, et al.			
	AJ	4,767,608	8/30/88	Matsumoto, et al.			
<b>FOREIGN PATENT DOCUMENTS</b>							
		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES NO
SH	AK	GB 2 101 983 A	2/23/83	United Kingdom			
	AL	2 160 696	6/20/90	Japan			
	AM	2 221 194	2/21/89	Japan			
	AN	1,587,000	8/23/90	Russia			
	AO	2,414,215	1/8/76	Germany			
<b>OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)</b>							
SH	AP	Aihara et al., Spherical Aromaticity of Buckminsterfullerene, <u>Bull. Chem. Soc. Jpn.</u> , 61, 1988, pp. 2657-2659					
	AR	Akhter, et al., The Structure of Hexane Soot II: Extraction Studies, <u>Applied Spectroscopy</u> , 39(1), 1985, pp. 154-167					
	AS	Almlof et al., Theoretical Methods and Results for Electronic Structure Calculations on Very Large Systems Carbon Clusters, <u>ACS Symposium Series</u> , 353, 1987, pp. 35-48					
	AT	Amato, A First Sighting of Buckyballs in the Wild, <u>Science</u> , 257(5067), 1992, p. 167					
	AU	Amic et al., On the Lack of Reactivity of Buckminsterfullerene: A Theoretical Study, <u>J. Chem. Soc. Perkin Trans.</u> , 1990, pp. 1595-1598					
	AV	Bacon, R., <u>J. Applied Physics</u> , 31(2), 1960, pp. 283-290					
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SH ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	AA	4,915,977	4/10/90	Okamoto, et al.				
	AB	4,922,827	5/8/90	Remo				
	AC	5,114,477	5/19/92	Mort, et al.				
	AD	5,132,105	7/21/92	Remo				
	AE	5,234,474	6/19/91	Whewell				
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SH ↓ ↓ ↓ ↓ ↓	AP	Balasubramanian et al., Computer Generation of Spectra of Graphs: Applications to C <sub>60</sub> Clusters and Other Systems, <u>Journal of Computational Chemistry</u> , 9(4), 1988, pp. 406-415						
	AR	Ballester et al., Atoms in Carbon Cages as a Source of Interstellar Diffuse Lines, <u>The Astrophysical Journal</u> , 356, 1990, pp. 507-512						
	AS	Blau et al., An Investigation of the Microfrictional Behavior of C <sub>60</sub> Particle Layers on Aluminum, <u>Thin Solid Films</u> , 219, 1993, pp. 129-134						
	AT	Bloomfield et al., Negative and Positive Cluster Ions of Carbon and Silicon, <u>Chemical Physics Letters</u> , 121(1)(2), 1985, pp. 33-37						
	AU	Bochvar et al., Problems in the Structural Chemistry of Crystalline Carbon, <u>Sov. Sci. Rev. B. Chem.</u> , 9, 1987, pp. 483-527						
	AV	Brendsdal et al., Normal Coordinate Analysis of "Footballene" C <sub>60</sub> , <u>Spectroscopy Letters</u> , 21(4), 1988, pp. 313-318						
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SH	AP	Brendsdal, Symmetry Coordinates of Molecular Vibrations of "Footballene" C <sub>60</sub> , <u>Spectroscopy Letters</u> , 21(4), 1988, pp. 319-339					
SH	AR	Brendsdal et al., Kekule Structures of Footballene, <u>Journal of Molecular Structure (Theochem)</u> , 1989, pp. 55-66					
SH	AS	Brown, High Symmetries in Quantum Chemistry, <u>Chemical Physics Letters</u> , 136(2), 1987, pp. 128-133					
SH	AT	Buseck et al., Fullerenes from the Geological Environment, <u>Science</u> , 257(5067), 1992, pp. 215-217					
SH	AU	Bussoletti, Dusty Objects in the Universe, pp. 89-93					
SH	AV	Campbell et al., An Intense, Simple Carbon Cluster Source, <u>J. Chem. Phys.</u> , 93(9), 1990, pp. 6900-6907					
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SH	AR	Ceulemans et al., The Jahn-Teller Instability of Fivefold Degenerate States in Icosahedral Molecules, <u>J. Chem. Phys.</u> , 93(2), 1990, pp. 1221-1234					
SH	AS	Coulantbeau et al., Calculs de Proprietes Electroniques et des Frequences Normales de Vibration D'Aggregats Carbones Formant Des Polyedres Reguliers et Semi-Reguliers, <u>Journal de chimie physique</u> , 84, 1987, pp. 7-8					
SH	AT	Cox et al., C <sub>60</sub> La:A Deflated Soccer Ball?, <u>J. Am. Chem. Soc.</u> , 108, 1986, pp. 2457-2458					
SH	AU	Cox et al., Carbon Clusters Revisited: The "Special" Behavior of C <sub>60</sub> and Large Carbon Clusters, <u>J. Chem. Phys.</u> , 88(3), 1988, pp. 1588-6907					
SH	AV	Creasy, Some Model Calculations of Carbon Cluster Growth Kinetics, <u>J. Chem. Phys.</u> , 92(12), 1990, pp. 7223-7233					
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SH	AR	Creasy et al., Formation of High Mass Carbon Cluster Ions from Laser Ablation of Polymers and Thin Carbon Films, <u>J. Chem. Phys.</u> , 92(4), 1990, pp. 2269-2277					
SH	AS	Curl et al., Probing C <sub>60</sub> , <u>Science</u> , 242, 1988, pp. 1017-1022					
↓	AT	Curl et al., Fullerenes, <u>Scientific America</u> , 1991, pp. 54-64					
↓	AU	Cyvin et al., Molecular Vibrations of Footballene, <u>Chemical Physics Letters</u> , 143(4), 1988, pp. 377-380					
↓	AV	Daniel, Jr., Studies Toward a Convergent Synthesis of C <sub>60</sub> , <u>Dissertation Abstracts International</u> , 49(5), 1988, p. 1706-B					
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SH	AP	Dias, A Facile Huckel Molecular Orbital Solution of Buckminsterfullene Using Chemical Graph Theory, <u>Journal of Chemical Education</u> , 66(12), 1989, pp. 1012-1015					
SH	AR	Dietz et al., Laser Production of Supersonic Metal Cluster Beams, <u>J. Chem. Phys.</u> , 74(1), 1981, pp. 6511-6512					
SH	AS	Disch et al., On Symmetrical Clusters of Carbon Atoms: C <sub>60</sub> , <u>Chemical Physics Letters</u> , 125(5) (6), 1986, pp. 465-466					
SH	AT	Ebbesen, et al., Origins of Fullerenes in Rocks, <u>Science</u> , 268, 1995, pp. 1634-1635					
SH	AU	Elser et al., Magnetic Behavior of Icosahedral C <sub>60</sub> , <u>Physical Review of General Physics Third Series</u> , 36(10), 1987, pp. 4579-4585					
SH	AV	Elser et al., Icosahedral C <sub>60</sub> : An Aromatic Molecule with a Vanishingly Small Ring Current Magnetic Susceptibility, <u>Nature</u> , 325, 1987, pp. 792-794					
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	AP	Feld et al., Carbon Cluster Emission from Polymers Under Kilolectronvolt and Magaelectronvolt Ion Bombardment, <u>J. Phys. Chem.</u> , 94, 1990, pp. 4595-4599					
	AR	Feng et al., Quantum-Chemical Investigation of Buckminsterfullerene and Related Carbon Clusters (I):The Electronic Structure and UV Spectra of Buckminsterfullerene and Other C <sub>60</sub> Cages, <u>International Journal of Quantum Chemistry</u> , XXXVII, 1990, pp. 509-607					
	AS	Fowler et al., $\pi$ -Systems in Three Dimensions, <u>Chemical Physics Letters</u> , 127(1), 1986, pp. 78-83					
	AT	Fowler, Carbon Cylinders:A Class of Closed-shell Clusters, <u>J. Chem. Soc. Faraday Trans.</u> , 86(2), 1990, pp. 2073-2077					
	AU	Fowler, How Unusual is C <sub>60</sub> ? Magic Numbers for Carbon Clusters, <u>Chemical Physics Letters</u> , 131(6), 1986, pp. 444-450					
	AV	Fowler et al., Systematics of Bonding in Non-Icosahedral Carbon Clusters, <u>Theor. Chim. Acta</u> , 73, 1988, pp. 1-26					
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	AP	Fowler et al., Electric and Magnetic Properties of the Aromatic Sixty-Carbon Cage, <u>Chemical Physical Letters</u> , 165(1), 1990, pp. 79-86					
	AR	Fowler et al., The Leapfrog Principle: A Rule for Electron Counts of Carbon Clusters, <u>J. Chem. Soc., Chem. Commun.</u> , 1987, pp. 1403-1405					
	AS	Gerhardt et al., Polyhedral Carbon Ions in Hydrocarbon Flames, <u>Chemical Physical Letters</u> , 137(4), 1987, pp. 306-310					
	AT	Gerhardt et al., The Formation of Polyhedral Carbon Ions in Fuel-Rich Acetylene and Benzene Flames, Twenty-Second Symposium (International) on Combustion/The Combustion Institute, 1988, pp. 395-401					
	AU	Gerhardt et al., Large Ionic Species in Sooting Acetylene and Benzene Flames, AGARD Proc. No. 422, Combustion and Fuels in Gas Turbine Origins, 1988, p. 22-1-22-11					
	AV	Gerhardt et al., Polyhedral Carbon Ions in Hydrocarbon Flames, <u>Chemical Physics Letters</u> , 137(4), 1987, pp. 306-310					
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SH	AR	Geusic et al., Photodissociation of Carbon Cluster Cations, <u>J. Chem. Phys.</u> , 86(7), 1987, pp. 3862-3869					
SH	AS	Haddon, Measure of Nonplanarity in Conjugated Organic Molecules: Which Structurally Characterized Molecule Displays the Highest Degree of Pyramidalization?, <u>J. Am. Chem. Soc.</u> , 112, 1990, pp. 3385-3389					
SH	AT	Haddon et al., Electronic Structure and Bonding in Icosahedral C <sub>60</sub> , <u>Chemical Physics Letters</u> , 125(5) (6), 1986, pp. 459-464					
SH	AU	Haddon et al., Icosahedral C <sub>60</sub> Revisited: An Aromatic Molecule with a Vanishingly Small Ring Current Magnetic Susceptibility, <u>Chemical Physics Letters</u> , 169(4), 1990, pp. 362-364					
SH	AV	Haddon et al., Rehybridization and $\pi$ -Orbital Alignment: The Key to the Existence of Spheroidal Carbon Clusters, <u>Chemical Physics Letters</u> , 131(3), pp. 165-169					
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SH	AP	Hahn et al., Magic Numbers in C <sub>n</sub> and C <sub>n</sub> Abundance Distributions, <u>Chemical Physics Letters</u> , 130(1)(1), 1986, pp. 12-16					
SH	AR	Hale, Discrete-Variational-X Alpha Electronic Structure Studies of the Spherical C <sub>60</sub> Cluster: Prediction of Ionization Potential and Electronic Transition Energy, <u>J. Am. Chem. Soc.</u> , 108, 1986, pp. 6087-6088					
SH	AS	Harano et al., Decomposition of Gaseous Hydrocarbons in a Laser-induced Plasma as a Novel Carbonaceous Source for Cluster Formation, <u>Chemical Physics Letters</u> , 172(3)(4), 1990, pp. 219-223					
SH	AT	Hargittai et al., Quasicrystals, Networks and Molecules of Fivefold Symmetry, pp. 239-287					
SH	AU	Harter et al., Rovibrational Spectral Fine Structure of Icosahedral Molecules, <u>Chemical Physics Letters</u> , 132(4)(5), 1986, pp. 387-392					
SH	AV	Harter et al., Rotation-Vibration Spectra of Icosahedral Molecules. I. Icosahedral Symmetry Analysis and Fine Structure, <u>J. Chem. Phys.</u> 90(9), 1089, pp. 4727-4743					
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SH	AP	Hayden et al., $\pi$ Bonding in the Icosahedral $C_{60}$ Cluster, <u>Physical Review B</u> , 36(9), 1987, pp. 5010-5015					
SH	AR	Haymet, $C_{120}$ and $C_{60}$ : Archimedean Solids Constructed from $sp^3$ Hybridized Carbon Atoms, <u>Chemical Physics Letters</u> , 122(5), 1985, pp. 421-424					
SE	AS	Haymet, Footballene: A Theoretical Prediction for the Stable, Truncated Icosahedral Molecule $C_{60}$ , <u>J. Am. Chem. Soc.</u> , 108, 1986, pp. 319-321					
SH	AT	Heath, The Formation of Long Carbon Chain Molecules during Laser Vaporization of Graphite, <u>J. Am. Chem. Soc.</u> , 109, 1987, pp. 359-363					
SH	AU	Heath et al., Long Carbon Chain Molecules in Circumstellar Shells, <u>The Astrophysical Journal</u> , 314, 1987, pp. 352-355					
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Form PTO-1449 (REV. 7-80)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		Atty. Docket No. 79112Y		Serial No. 08/471,890	
<b>LIST OF PRIOR ART CITED BY APPLICANT</b>  (Use several sheets if necessary)				Applicant Donald R. Huffman, et al.			
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OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)							
SH	AP	Heath et al., The UV Absorption Spectrum of C <sub>60</sub> (buckminsterfullerene): A Narrow Band at 3860 Å, <u>J. Chem. Phys.</u> , 87(7), 1987, pp. 4236-4238					
SH	AR	Hecht, ...and shower the Earth with buckyballs, <u>Science</u> , 1994, pp. 16					
SH	AS	Hess, Jr. et al., The Stability of Footballene, <u>J. Org. Chem.</u> , 1986, pp. 3902-3903					
SH	AT	Heymann, et al., Fullerenes in the Cretaceous-Tertiary Boundary Layer, <u>Science</u> , 265, 1994, pp. 645-647 Heymann, Buckminsterfullerene, its Siblings, and Soot, Carriers of Trapped Inert Gases in Meteorites?, <u>Proceedings of the Seventeenth Lunar and Planetary Science Conference, Part 1, Journal of Geophysical Research</u> , 91(B13), 1986, pp. E135-E138					
SH	AU	Huffman, Methods and Difficulties in Laboratory Studies of Cosmic Dust Analogues, in <u>Experiments on Cosmic Dust Analogues</u> , Edited by Bussioletti et al., 1988, pp. 25-42					
SH	AV	Hollow Molecules, <u>New Scientist</u> , 1966, pp. 118-119					
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	AT	Iijima, The 60-Carbon Cluster Has Been Revealed?, <u>J. Phys. Chem.</u> , 91, 1987, pp. 3466-3467					
	AU	Jelski et al., Clusters: Link Between Molecules and Solids, <u>Journal of Chemical Education</u> , 65(10), 1988, pp. 879-883					
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SH	AP	Joblin et al., Detection of Diffuse Interstellar Bands in the Infrared, <u>Nature</u> , 346, 1990, pp. 729-731					
SH	AR	Kaldor et al., Molecular Surfaces: Chemistry and Physics of Gas Phase Clusters, Microclusters: Proceedings of the First NEC Symposium, 1987, pp. 96-106					
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SH	AR	Kirk-Othmer, Encyclopedia of Chemical Technology, Third Edition, Volume 4, Blood, Coagulants and Anticoagulants to Cardiovascular Agents, pp. 652-653					
SH	AS	Klein et al., Icosahedral Symmetry Carbon Cage Molecules, <u>Nature</u> , 323, 1986, pp. 703-706					
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SH  ↓	AP	Kratschmer et al., The Infrared and Ultraviolet Absorption Spectra of Laboratory-Produced Carbon Dust: Evidence for the Presence of the C <sub>60</sub> Molecule, <u>Chemical Physics Letters</u> , 170(2)(3), 1990					
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SH  ↓ ↓ ↓	AP	Kroto et al., The Formation of Quasi-Icosahedral Spiral Shell Carbon Particles, <u>Nature</u> , 331, 1988, pp. 328-331					
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	AT	Kroto, The Chemistry of the Interstellar Medium, <u>Phil. Trans. R. Soc. Land. A</u> , 325, 1988, pp. 405-421					
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	AV	Kroto, C <sub>60</sub> Fullerenes, Giant Fullerenes and Soot, <u>Pure &amp; Appl. Chem.</u> , 62(3), 1990, pp. 407-415					
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	AV	Kurihara, et al., High rate synthesis of diamond by dc plasma jet chemical vapor deposition, <u>Appl. Phys. Lett.</u> , 52(6), 1988, pp. 437-438					
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SH	AP	Larsson et al., OPTICAL SPECTRUM OF THE ICOSAHEDRAL C60- "FULLERENE-60", <u>Chemical Physical Letters</u> , 137(6), 1987, pp. 501-503					
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↓	AU	Lefevre, An Experimental Study of the Dust of Iron, Carbon, Silicon Carbide and Silica, <u>Astron. &amp; Astrophys.</u> , 5(1), 1970, pp. 37-44					
↓	AV	Lefevre, J., <u>Astron. Astrophys.</u> , 5, 1970, p. 37 and pp. 39-44					
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SH	AU	Löffler et al., Polyhedral Carbon Ions in Hydrocarbon Flames, <u>Chemical Physics Letters</u> , 137(4), 1987, pp. 306-310					
SH	AV	Luthi et al., Ab Initio Studies on the Thermodynamic Stability of the Icosahedral C <sub>60</sub> Molecule "Buckminsterfullerene", <u>Chemical Physics Letters</u> , 135(4) (5), 1987, pp. 357-360					
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SH	AP	Marynick et al., Localized Molecular Orbitals and Electronic Structure of Buckminsterfullerene, <u>Chemical Physics Letters</u> , 132(4) (5), pp. 383-386					
SH	AR	Matsumoto, Chemical vapour deposition of diamond in RF glow discharge, <u>Journal of Materials Science Letters</u> , 4, 1985, pp. 600-602					
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SH	AT	Matsumoto et al., Growth of diamond particles from methane-hydrogen gas, <u>Journal of Materials Science</u> , 17, 1982, pp. 3105-3112					
SH	AU	McElvany et al., FIMS Studies of Mass-Selected, Large Cluster Ions Produced by Direct Laser Vaporization, <u>Chemical Physics Letters</u> , 134(3), 1987, pp. 214-219					
SH	AV	McElvany et al., Ion-Molecule Reaction Studies of Mass Selected Carbon Cluster Ions Formed by Laser Vaporization, <u>J. Chem. Phys.</u> , 85(1), 1986, pp. 632-633					
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Form PTO-1449 (REV. 7-88)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		Atty. Docket No. 79132Y		Serial No. 08/471,890	
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SH	AR	Spitsyn, B.V., et al., Vapor Growth of Diamond on Diamond and Other Surfaces, <u>Journal of Crystal Growth</u> , 52, 1981, pp. 219-226					
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SH	AP	Williams, Close Packing of Spheres, <u>J. Chem. Phys.</u> 87(7), 1987, pp. 4206-4211					
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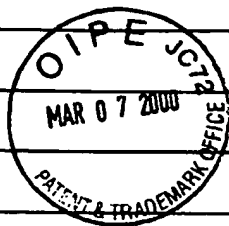
Applicant(s)  
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Filing Date  
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